भारतीय मानक
Indian Standard

IS 17678 : 2021

लघु सम्पुटित दाब परीक्षण (सेप्ट) कार्यप्रणाली

Short Encapsulation Pull Test (SEPT) Procedure

ICS 73.100.30

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भारतीय मानक ब्यूरो
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November 2021 **Price Group 2**

Mining Techniques and Equipment Sectional Committee, MED 08

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards after the draft finalized by the Mining Techniques and Equipment Sectional Committee had been approved by the Mechanical Engineering Divisional Council.

The composition of the Committee responsible for the preparation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SHORT ENCAPSULATION PULL TEST (SEPT) PROCEDURE

1 SCOPE

1.1 This standard specifies the methodology of performing monitoring by pull test of the full column grouted bolts and short encapsulation test for the resin grouted bolts and specified performance standards.

1.2 The short encapsulation pull test is used to measure the performance of the roof bolt system. The test is performed underground and it is the ultimate test of the roof bolting system.

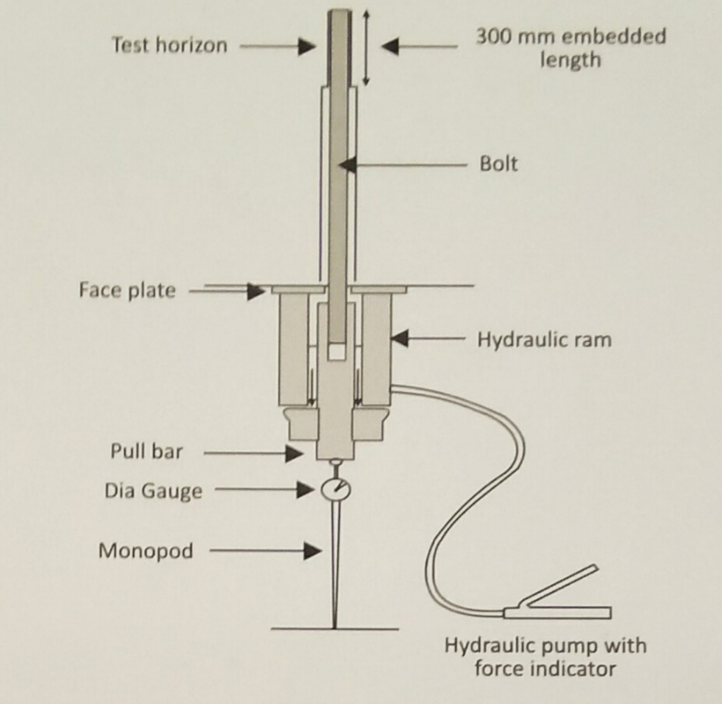
2 DESCRIPTION

A series of holes are drilled to varying depth and bolts of the required length are installed with a short resin capsule to give an encapsulated bolt length of not more than 300 mm. The pull test needs to be performed after a curing period of 30 min and not more than 8 h, after this an axial load is applied to the bolt end and bolt extension is measured. The load is applied up to 20 tonnes or until the maximum load of the system has been applied, whichever is greater.

3 PROCEDURE

Following equipment is used for pull test:

a) Tie wraps for resin capsule;
b) Knife;
c) Tape measure;
d) Pull test equipment comprising;
e) A suitable hydraulic ram;
f) Pressure gauge capable of reading pressure equivalent to a load of 30 tonnes to an accuracy of 1 tonne;
g) (25mm Range) Dial gauge capable of reading to 0.1 mm;
h) Monopod to support dial gauge;
j) Bearing plate;
k) Drawbar;
m) Shims of varying thickness; and
n) Bore-hole micrometer.



PULL TESTING EQUIPMENT

4 NUMBER OF TESTS

A minimum of two tests needs to be carried out at each of the chosen horizons, as an example for a 2.4m bolt length, these horizons would normally be at 600 mm, 1 800 mm and 2 300 mm. If a significant change in geology occurs within the bolted horizon, further tests need to be carried out at other horizons to determine their influence, if any, on the bond strength of the bolting system.

5 BOLT PREPARATION

The bolt length needs to be at least 40 mm longer than the hole length to allow full engagement to the drawbar on the threaded end of the bolt. Bolts need to be cut square to the bolt axis.

6 LOCATION

Place pull test as close as practicable to the free end of the heading. Chose a section of a reasonably flat roof, which is not subject to spalling.

7 CAPSULE PREPARATION

Determine the resin capsule length to produce not more than 300mm bolt encapsulation using the formula.

$$\text{Capsule length} = \frac{(\text{Hole dia.})^2 - (\text{bolt dia.})^2 \times \text{Encapsulated length}}{(\text{Capsule dia.})^2}$$

Prepare test resin capsule of the calculated length using the tie wraps and remove the excess capsule.

8 HOLE PREPARATION

The same drilling machine and operator need to be used throughout the test:

a) Use a new bit,

b) Measure the bit dia. before each test,

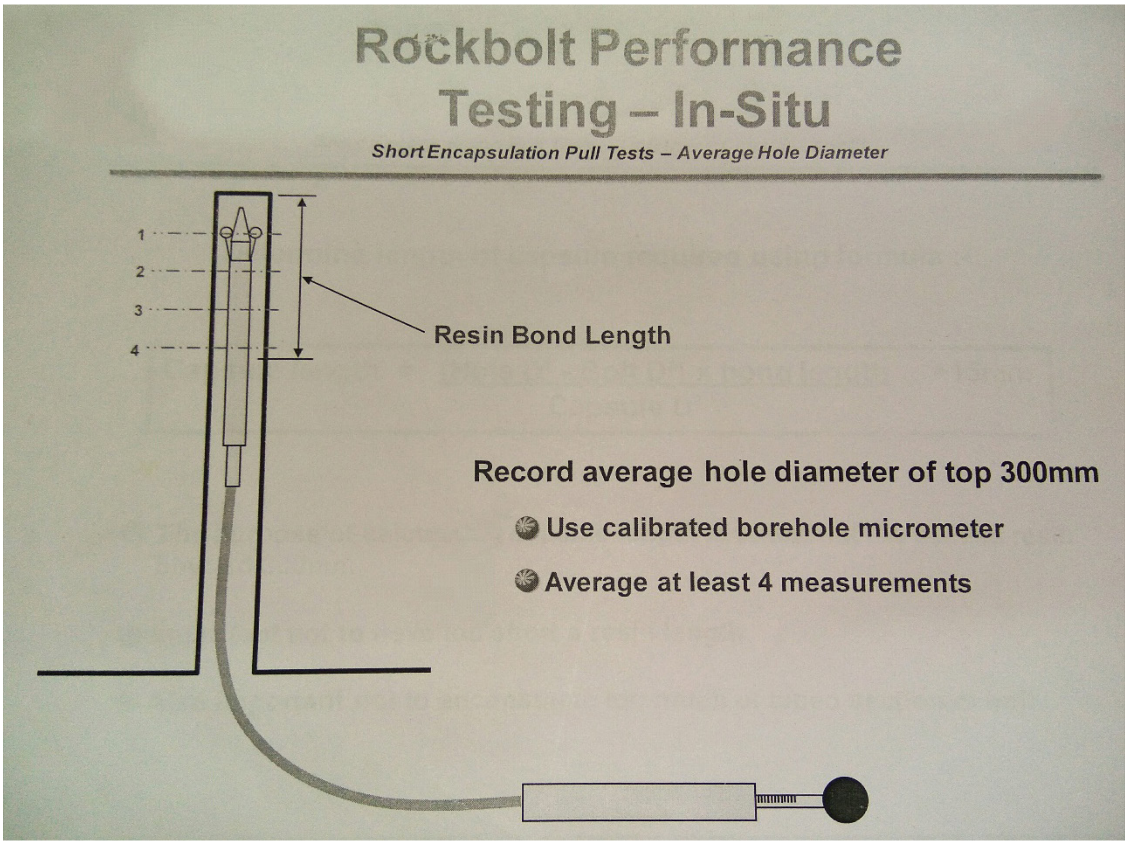
c) Use wet drilling,

d) Drill holes to the required length,

e) Record average hole dia. of top 300 mm,

f) Use calibrated borehole micrometer, and

g) Average at least 4 measurements.



Rockbolt Performance Testing – In-Situ

Short Encapsulation Pull Tests – Average Hole Diameter

Record average hole diameter of top 300mm

- **Use calibrated borehole micrometer**
- **Average at least 4 measurements**

9 BOLT INSTALLATION

The surface condition of the test section of the bolt needs to be free from rust, grease, paint, dirt and any other surface contaminant. Follow these steps.

a) Insert the capsule and bolt and push the capsule to the back of the test hole by hand;

b) Raise the machine to the bolt and engage;

c) Thrust and spin the bolt slowly to the back of the hole taking three-five seconds, after which the bolt should be spun for at least for a further seconds or as per manufacturer's instruction;

d) Wait for 30 s for fast setting and two minutes for slow setting resin capsule; and

e) Identify the test bolt for length by marking the roof

10 PULL TESTING

Bolts need to be pulled no sooner than 30 min and no later than 8 h after installation. This is to ensure that the resin has the time to cure and that no time-dependent roof movement mechanically locks the bolt in the hole.

For testing, align the ram along the axis of the bolt and make sure that the bolt is not in contact with the wall of the hole. This is best achieved by first trimming any loose material from around the mouth of the hole and then aligning the assembly by wedging steel shims between the roofs and bearing plate.

Apply the bolt load slowly, smoothly and without the push. The bolt displacement needs to be noted at every 1 tonne interval.

Minimum Performance Level of SEPT for use of Resin Capsules underground	
Short Encapsulation pull test after	
30 min	10 Tonne (For 20 mm dia roof bolt) 12 Tonne (For 22 mm dia roof bolt)
8 h or 24 h	15 Tonne (after 8 h) 20 Tonne (after 24 h)
Net displacement measure during SEPT	Not more than 15mm

11 FREQUENCY

Tests shall be conducted for every batch received by mine.

12 FAILURE OF TEST

In case of SEPT, failure batch shall be withdrawn from use in all mines and reported to Statutory Directorate.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Mining Techniques and Equipment Sectional Committee, MED 08

Organization	*Representative(s)*
Directorate General of Mines Safety, Dhanbad	Shri T. R. Kannan (***Chairman***) Shri M. Arumugam (*Alternate*)
Andhra Pradesh Heavy Machinery and Engineering Ltd, Vijaywada	Shri T. V. Ramana
Bharat Earth Movers Ltd, Bengaluru	Shri V. R. S. Prasad Rao Shri H. G. Suresh (*Alternate*)
Caterpillar India Private Limited, Chennai	Shri K. Reji Jose
Central Mine Planning and Design Institute Ltd, Ranchi	Shri S. K. Chaterji Shri U. Roy (*Alternate*)
Central Institute of Mining and Fuel Resesarch, Dhanbad	Dr M. K. Singh Shri Surajit Dey (*Alternate*)
Eastern Coalfields Limited, Sanctoria	Shri Manas Kumar Mishra
EIMCO Elecon (India) Ltd, Vallabh Vidyanagar	Shri B. K. Bhatt
Hindustan Copper Ltd, Kolkata	Shri R. C. Singla Shri P. K. Sharma (*Alternate*)
Hindustan Zinc Limited, Udaipur	Shri B.V. Rao
John Deere, Pune	Shri Kaliappan Karthik
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Nanda Millar Company, Kolkata	Shri J. P. Goenka Shri Madhur Goenka (*Alternate*)
National Mineral Devlopment Corporation, Hyderabad	Shri D. Rajasekaran Shri Pradeep Kumar (*Alternate*)
South Eastern Coalfields Ltd, Bilaspur	Shri Kapil K. Rai Shri D. Bhattacharjee (*Alternate*)
Tata Steel Ltd, Dhanbad	Shri Soumendhu Manjhi
BIS Directorate General	Shri Rajneesh Khosla, Scientist 'E' and Head, (MED) [Representing Director General (*Ex officio*)]

Member Secretary

Shri Sandeep Keshav,
Scientist 'C' (MED), BIS

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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